Numerical Simulation of Large Scale Amplitude Coronal Waves interacting with Corona Holes

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Abstract

We developed a new numerical code that is capable of performing 2.5D simulations of magnetohydrodynamic (MHD) wave propagation in the corona and its interaction with a low density region like a coronal hole (CH). We observe that the impact of the wave on the CH leads to effects like reflection and transmission of the incoming wave, stationary features at the CH boundary, reflections inside the CH or formation of a density depletion. The formation of stationary bright fronts was one of the primary reasons for the development of pseudo-wave theories. Here we show that stationary features at the CH boundary can be the result of the interaction of an MHD wave with a CH. We compare cases of varying densities inside the CH and different initial density amplitudes of the incoming wave. Morever, we analyze morphology and kinematics of primary and secondary waves, i.e. we describe the temporal evolution of density, magnetic field, plasma flow velocity, phase speed and position of the wave amplitude.